Verification Program for Optical Spectral Data

1. GENERAL INFORMATION

The National Fenestration Rating Council has developed a uniform national rating system for energy performance characteristics of fenestration products. Two rating systems have been approved:

NFRC 100-91 "Procedure for Determining Fenestration Products Thermal Performance (Currently Limited to U-values)".

NFRC 200-93 "Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence".

The rating system is reinforced by a product certification system under which ratings developed by NFRC accredited laboratories are reviewed and certified by NFRC licensed independent certification and inspection agencies (IA's) as conforming to NFRC requirements. Under the certification program, fenestration manufacturers may label products using an NFRC certification mark to indicate U-Factor ratings and Solar Heat Gain Coefficient ratings.

2. INTRODUCTION

The NFRC rating systems (NFRC 100, NFRC 200) rely on two computer simulation programs for calculating total fenestration thermal performance indices. These programs are WINDOW 4.1 (as developed by the Windows and Daylighting Group at Lawrence Berkeley Laboratories) and FRAME 2.1 (as developed by Enermodal Engineering). WINDOW 4.1 calculations are determined by algorithms and a data base that includes the spectral properties of glass and glazings (i.e., transmittance, reflectance, emittance). Glass suppliers, coaters and film manufacturers have relied upon a variety of standards for determining the optical properties of products, including ASTM, ISO, ASHRAE and other proprietary methods. The subsequent development and approval of NFRC 300-94 "Procedures for Determining Solar Optical Properties of Simple Fenestration Products" and NFRC 301-93 "Standard Test Method for Emittance of Specular Surfaces Using Spectrometric Measurements" has provided a uniform method for determining the spectral properties of glass and glazings.

In order to provide uniform and credible spectral data into the Window 4.1 files a verification program is outlined in this appendix.

3. PROGRAM REQUIREMENTS

A. SPECTRORADIOMETRIC MEASUREMENTS QUALIFICATIONS

All submitters of spectroradiometric data (or their representatives) shall have successfully participated (see NOTE #1) in an NFRC Round Robin. NFRC shall sponsor future round robins at least every 5 years or on an "as needed" basis.

B. REPRESENTATIVE DATA

The submitter shall choose the products to be included in the spectroradiometric data files for WINDOW 4.1 program and for submission to NFRC. For each product, the submitter shall determine the data that represents measured emissivity, solar transmittance, solar reflectance (front) and solar reflectance (back). This representative data shall be based on the actual glass thickness (not nominal thickness). The representative data shall be the equivalent of a sample with average spectroradiometric properties for the product as sold by the submitter (prior to any fabrication processes). The criteria to be used for identifying the representative data shall be determined by each submitter. A record shall be kept by the submitter that supports and describes the selection of the representative data.

C. SAMPLE SELECTION AND STORAGE

The submitter shall store and retain, for a period of two years, the sample which best fits the integrated spectroradiometric properties of the submitted representative data (see 3.B.) and which, if possible, falls within the allowable measurement tolerances (see NOTE #1). If the physically stored sample does not fall within these tolerances for all integrated properties, the spectral data of the physical sample must also be saved. One sample may be used to develop the representative data for a grouping of products of substrates of different thicknesses. In those cases where sample storage is undesirable (certain types of coatings are known to be unstable outside of a sealed insulating glass unit) challenge procedures shall be related only to submitted data (see NOTE #1) and not to a sample. In any case, a sample should be saved for DATA REVIEW (see Section E).

D. DATA SUBMITTAL

All spectroradiometric data files submitted for use in the materials library of the NFRC approved WINDOW simulation program shall be submitted with an approved submission form and signed by a representative of the submitter verifying that measurements were made in accordance with NFRC 300 and NFRC 301.

E. DATA REVIEW

All spectroradiometric data files shall be submitted to NFRC for review. The DATA REVIEW process is limited to a 21 day period and shall begin anew every 60 days. Data will be checked for conspicuous errors, discontinuity, noise, suspicious results and completeness of the file.

Participation in the DATA REVIEW shall include all parties submitting spectroradiometric data and NFRC. All participants retain the right to question any data submitted. In the case of questionable data, the following procedures shall be used:

1. In order for a specific product to be questioned by NFRC, or any other interested party, the following information must be provided in writing:

    a. the product and representative data being questioned;

    b. the technical reason that the data is questioned;

    c. any proof or basis for supporting the question (samples measured, etc.).

2. NFRC will review the information submitted and if the information provided appears conclusive, shall contact the submitter (whose product has been questioned) and request that a sample of the product in question be submitted for review. Upon notification of this request, the submitter must agree to ship the sample in question (see Section 3.C) within two weeks to the designated representative for re-measurement. Samples not sent within two weeks of the request shall result in the removal of that product's "representative data" from the submission. Samples shall be re-measured and a determination made as to the spectral properties (representative data) of the product. If the results fall within the measurement tolerances (see NOTE #1) for the overall weighted transmittance, reflectance and emittance values of the representative data the data file submitted shall remain unchanged.

3. If after review of the sample, the results fall outside the allowable instrument measurement tolerances (see NOTE #1), the submitter can choose to:

    a. Withdraw that prooduct from consideration for use in the WINDOW spectroradiometric data file.

b. Agree to re-submit another set of representative data of the product to be used in the WINDOW spectroradiometric data file.

c. Ask for re-consideration of the representative data in accordance with the APPEALS section (see Section H).

NOTE 1: Allowable instrument measurement tolerance for spectroradiometric measurements shall be defined as ± 0.01 for transmittance data and ± 0.02 for reflectance and emittance data. (For example a published transmittance value of .50 should have a retested transmittance value between .49 and .51. A published reflectance value of .21 should have a retested reflectance value of between .18 and .22). It should be noted that any challenges to the representative data (from the DATA REVIEW or from GENERAL CHALLENGE PROCEDURES) shall be judged by NFRC (or its designated representative) for accuracy.

NOTE 2: Spectral data should be correlated back to the glass thickness for which the representative data was reported. Note that representative data is submitted for a target glass thickness, actual samples will most likely vary in thickness.

NOTE 3: Measured values of typical production of spectral products may vary outside the allowable instrument measurement tolerances outlined in NOTE #1. Guidelines for questioning the data submitted for DATA REVIEW should be based on individual manufacturers published production tolerances. In the absence of such information, the following tolerances on the overall weighted performance may be used for guidance:

a) Emittance = ± 0.03
b) Transmittance = ± 0.03 uncoated glass
c) Transmittance = ± 0.06 coated glass
d) Reflectance = ± 0.03 uncoated glass
e) Reflectance = ± 0.06 coated glass

F. ACCEPTANCE PROCESS

All submitters (and their representatives), that have followed the procedure outline in Sections A through E above, shall receive a formal reply letter from NFRC (or it's delegated representative) stating that the representative data for each product has been accepted into the WINDOW 4.1 spectral data files for use in determining NFRC ratings on fenestration products.

G. GENERAL CHALLENGE PROCEDURE

The GENERAL CHALLENGE PROCEDURE applies to products appearing in the spectral data library of the WINDOW program and any appeals.

1. The spectroradiometric data published in WINDOW is open for challenge by any interested party. GENERAL CHALLENGES shall be filed through NFRC and shall follow the procedures outlined in Section 5.0 of the NFRC Product Certification Program (PCP) 1-92 with the following exceptions:

    a. references to products identified in the Certified Product Directory shall now apply to products identified in the WINDOW 4.1 program spectral data files.

    b. Notice of Challenges shall be submitted directly to NFRC rather than an accredited Independent Certification and Inspection Agency (IA).

    c. escrow deposits charged to the challenger shall be held by NFRC.

    d. The validity of the challenge shall be determined by the ***NFRC Challenge Board*** and in accordance with the guidelines and tolerances outlined under Section E DATA REVIEW.

H. APPEALS PROCEDURE

If a submitter of spectroradiometric data to the WINDOW program disagrees with the measurements determined for a sample by NFRC (or its designated representative) the submitter may choose to submit a secondary set of samples for the product challenged. This secondary set must consist of a minimum 10 samples chosen at random from two or more production runs. The NFRC shall distribute the samples to <u>two other facilities</u> (not involved in the question or challenge) that have successfully submitted spectral data to the WINDOW data files. These facilities have a maximum of 14 days to review the samples and return results to NFRC. NFRC will review the results of the spectrometric measurements from these sources to make the final determination regarding validity of the representative data of a product.

I. WITHDRAWAL OF ACCEPTANCE

Any challenged product that is determined to have spectroradiometric measurements outside of the acceptable range shall have its "acceptance" status removed from the WINDOW data files. NFRC shall send a formal letter to the submitter notifying them of the results of the appeal/challenge. Subsequent updates of the WINDOW program will exclude the product from its data files, unless the submitter re-submits the product in accordance with the timelines and procedures outlined in this program.